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Comparison of vacuum assisted closure (VAC) application with conventional treatment after surgical intervention in patients with Fournier's gangrene

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Abstract

Aim: This study aims to evaluate the etiology and predisposing factors of patients with Fournier's gangrene and to compare the results and effectiveness of vacuum-assisted wound closure (VAC) and traditional dressing and debridement methods on wound healing after surgical intervention.

Material and Methods: This retrospective study was conducted by collecting the data of 65 patients with Fournier's gangrene who applied to our hospital between March 1, 2016 and March 1, 2023. In this study, we divided our patients into two groups: those who were treated with VAC and those who were treated with conventional treatment. We evaluated these two groups according to certain parameters, for example, DM and obesity. The study was approved by the Ethics Committee on 21 June, 2023.

Results: A total of 65 patients were included in the study. Of these, 50 (87%) were male and 15 (13%) were female. The mean age of the patients was 52.6 ±10.45 years. Thirty-one patients were followed up with VAC, while conventional treatment was used in 34. However, in the comparison made without considering the predisposing factors, no significant difference was found between the two groups in terms of length of hospital stay. In addition, it has been statistically proven that VAC treatment is ahead of the traditional treatment method in terms of hospital stay in cases with obesity and DM. Considering their comorbid diseases, it was seen that they were effective on the length of hospital stay.

Discussion: Many methods have been tried in the care and follow-up of the wound in Fournier's gangrene. Although they do not have clear advantages over each other, an appropriate patient-based method is used. The importance of other factors such as having similar effects, cost analysis, and length of hospital stay come to the fore.

Keywords

Fournier Gangrene, Vacuum-Assisted Wound Closure (Vac), Hospitalization, Wound Care

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Introduction

Fournier's gangrene is an urgent microbial pathology characterized by necrotizing fasciitis involving the perianal and genital regions, which develops acutely, progresses rapidly and insidiously, and results in high mortality and morbidity when diagnosis and treatment are delayed [1]. Despite aggressive treatment, Fournier's gangrene has high morbidity and mortality rates (3-67%), delay in diagnosis and treatment may cause a significant increase in mortality rate [3] (20-40%). This is followed by various skin pathologies [4]. In addition, some accompanying pathologies often accompany Fournier's gangrene, regardless of the primary etiology. Diabetes mellitus leads to these pathologies with a rate of 20-70%, followed by chronic alcoholism with a rate of 20-50% [4,5]. Treatment of Fournier's gangrene includes resuscitation for sepsis and surgical debridement with extensive antibiotics [6]. Despite all aggressive treatments, mortality can be as high as 63% [2]. The standard treatment in Fournier's gangrene consists of debridement of necrotic tissues, broad-spectrum antibiotic therapy, frequently changing dressings, and intensive care resuscitation when necessary [1]. Long hospital stays and repetitive dressings increase the cost and cause a loss of workforce. In order to reduce this, many methods such as sterile saline, antiseptic sitz baths, Dakin's solution (sodium hypochlorite), hydrogen peroxide, unprocessed honey, lyophilized collagenase, hyperbaric oxygen therapy, vacuum-assisted wound closure (VAC) have been tried [4]. VAC is a relatively new technology developed for the treatment of many acute and chronic wounds that are difficult to manage [8]. The VAC system creates negative pressure in the wound with the help of vacuum, thus removing the infected or exudative fluids that will occur in the wound from the environment, reducing the edema in the region with the help of micropressure, stimulating angiogenesis and thus accelerating wound healing [9]. Many studies have emphasized that VAC application is effective but its effect is not better than standard treatment methods. However, it has been determined that the use of VAC reduces the cost with fewer dressing changes and less need for analgesics [7]. In addition, the area of use has expanded upon successful results in the use of vac. In our study, we investigated the effects of vacuum-assisted wound closure (VAC) and traditional dressing and debridement methods on wound healing after surgical intervention.

Material and Methods

Following institutional review board approval from the Ethics Committee of Atatürk Sanatoryum Training and Research Hospital (Ethics No: 2012-KAEK-15/2734), we performed a single-center retrospective analysis of patients with Fournier's gangrene and who underwent extensive surgical debridement and antibiotherapy in our hospital between March 1, 2016 and March 1, 2022. We included patients aged between 18-75 years, who were compliant with treatment, and who had no oncological comorbidities. We divided these patients into two groups: VAC treatment and conventional treatment.

Demographic data of the patients, length of hospital stay, time from the first debridement to wound healing, wound healing times were recorded. Most of the patients in our study group had obesity.

Wound healing was calculated as the time from initial debridement to discharge. The patients were divided into 2 groups. Vacuum-assisted wound closure (VAC), and traditional dressing and debridement methods were applied. Vacuum-assisted wound closure was performed after the first debridement. In patients who underwent VAC, VAC was changed every 72 hours. Nitrofurazone-containing dressing was applied after wound irrigation with saline every 24 hours in patients who had traditional dressings. Both groups were reevaluated between dressings. Debridement was performed again when necessary. In cases with clean wounds, the primary repair was completed.

Statistical analysis

Categorical variables were expressed as number of patients (frequency) and percentage (%). Descriptive statistics were presented as mean ± standard deviation for continuous numerical variables. Associations between variables were evaluated using the Student's T-test (for continuous variables) and the Chi-Square test (for categorical variables), where appropriate. All analyzes were performed with SPSS v22 package program. A p-value <0.05 was considered significant.

Ethical Approval

Ethics Committee approval for the study was obtained.

Results

Table 1 Shows the number and percentage of patients who were applied VAC vs convational application according to sex, diabetes and obesity.

A total of 65 patients were included in the study. Of these, 50 (87%) were male and 15 (13%) were female. The mean age of the patients was 52.6 ±10.45 years. While 31 (47%) patients were followed with VAC dressing, 34 (53%) were followed up with traditional methods (with nitrofurazone-containing dressing). Among those who underwent VAC, there were 10 patients with concomitant DM and 21 patients with obesity. There were 8 patients who were associated with DM and 18 obese patients among the patients who underwent traditional dressing and debridement. Table 2 shows the number of Group A and Group B patients by their predisposing factors.

In the comparison made without considering the predisposing factors, there was no statistically significant difference in terms of recovery time between Group-A VAC patients and Group-B conventional dressing patients (p=0,087). The mean hospital stay of the patients was 23.78. While the length of stay was 22.3 ± 4.6 in those who underwent VAC, the length of stay in the hospital was 25.1 ± 4.7 in the patients who underwent conventional dressing. It was statistically significant that the wound healing time was shorter in patients who underwent VAC compared to patients who underwent dressings (p=0,003). Table 3 shows the numerical and statistical results of the effects of predisposing factors and treatment methods on the length of hospital stay.

The number of patients with diabetes was 10 in those treated with VAC and 8 in those treated with conventional therapy. Diabetes-related recovery time between both groups was shorter in those who underwent VAC and was statistically significant (p=0,002).

Table 1. Number and percentage of patients who were applied VAC vs convational application according to sex, diabetes and obesity.

	VAC applied		Conventional application		p-value
Sex	Female (n: 6 p: %9.2)	Male (n: 25 p: %38.4)	Female (n: 9 p: %13.8)	Male (n: 25 p: %38.4)	0.49
Diabetes	Exists (n: 10 p: %15.4)	None (n: 21 p: %32.3)	Exists (n: 8 p: %12.3)	None (n: 26 p: %40)	0.43
Obesity	Obese (n: 21 p: %32.3)	Nonobese (n: 10 p: %15.4)	Obese (n: 18 p: %27.6)	Nonobese (n:16 p: %24.6)	0.22

Table 2. Number of Group A and Group B patients by their predisposing factors.

Predisposing factors	Group A number of patients (VAC applied)	Group B number of patients (conventional method)
Accompanied by diabetes	10	8
Accompanied by obesity	21	18

Table 3. Numerical and statistical results of the effects of predisposing factors and treatment methods on the length of hospital stay.

Duration of hospital stay in predisposing factors determined in the case					
Predisposing factors	Group A Patients		Group B Patients		P-value
	Number	Hospitalization (day)	Number	Hospitalization (day)	
Diabetes	15	21.4 ± 4.9	17	25.2 ± 5.0	P: 0.03
Obesity	21	21.9 ± 3.9	18	26.4 ± 4.9	P: 0.003

Discussion

Standard treatment in Fournier's gangrene consists of debridement of necrotic tissues, broad- spectrum antibiotics, frequently changing dressings, and intensive care resuscitation when necessary. Many methods have been tried in the care and follow-up of the wound in Fournier's gangrene. Although they do not have clear advantages over each other, the appropriate patient-based method is used [5]. The importance of other factors such as having similar effects, cost analysis and length of hospital stay come to the fore. In studies conducted so far, DM accelerates the progression of infection and delays wound healing. However, in our study, DM alone did not make a significant difference in the length of hospital stay in the evaluation made without considering the treatment methods. The positive effects of VAC therapy on wound healing and its safe use are now known [4]. In other studies, it has been shown that hospitalization time is shorter in patients who are treated with VAC compared to those who do not receive VAC treatment [8]. In our study, we found that VAC therapy provided a significant shortening of wound healing and hospital stay. Although diabetes is the most important predisposing factor, it did not adversely affect the prognosis and clinical outcomes in our study [10]. However, we think that diabetes affects the disease negatively and induces the development of Fournier disease in patients with diabetic Fournier's gangrene, and there are studies supporting this theory. Diabetes can accelerate the progression of the infection and delay wound healing. In addition, in our study, we encountered results regarding the superiority of VAC therapy in the comparison of treatment methods in patients with DM. As a result, we observed a significant decrease in hospitalization times in patients with diabetes who underwent VAC compared to the traditional treatment method. Advanced age, diabetes mellitus, chronic liver disease, chronic kidney failure, alcoholism, smoking and immunosuppressive conditions are known risk factors for Fournier's gangrene [2,6]. However, we did not include them in our study because the number of these additional diseases was too low to be statistically significant in our patients. As a result, early diagnosis and determination of the severity of the disease, decreases the time of treatment and increase the success of treatment. We think that aggressive surgical debridement and appropriate antibiotic therapy may have a positive effect on the prognosis of the disease. Fournier's gangrene is a disease with high mortality rates, although the possibilities for diagnosis, follow-up and treatment have increased recently. Early diagnosis is the most important factor in obtaining satisfactory results. Multi-step and aggressive treatment methods including protective colostomy, hyperbaric oxygen and VAC applications and reconstructive surgery are effective and beneficial in the treatment of Fournier's gangrene. Morbidity and mortality can be reduced in patients with Fournier's gangrene with a multidisciplinary treatment approach. In particular, the application of VAC had a positive impact on both the length of hospital stay and the recovery process. Therefore, we think that using VAC should have wider usage areas compared to cost ratios.

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Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement
All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest
The authors declare no conflict of interest.

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